REQUEST FOR RECONSIDERATION

As an initial matter, Applicants wish to thank Examiner Koehler for withdrawing the Requirement for Restriction dated February 15, 2005, and examining all of the claims of the present invention.

The present invention relates to a long-life heat-resisting low alloy steel welded component of a structure and a method of manufacturing the same.

The present invention addresses the drawbacks of steel welded components manufactured by conventional techniques by providing a low alloy steel welded component, used under a high-temperature and high-pressure atmosphere, that does not cause creep damage in a heat-affected zone. For instance, the present inventors have discovered that by normalizing a base metal material (e.g., a steel plate) one or more times before welding creep damage (i.e., type IV creep damage) is prevented. Such a low alloy steel welded component and method of manufacturing the same is nowhere disclosed or suggested in the cited prior art of record.

The rejection of claims 1-29 under 35 U.S.C. § 102(b) as allegedly anticipated by European Patent Application No. 1 143 026 A1 ("EP'026") is respectfully traversed.

EP '026 does not disclose or suggest a long-life heat-resisting low alloy steel welded component of a structure or a method of manufacturing the same, in which a base metal a base metal is normalized one or more times before welding in order to prevent type IV creep damage.

As pointed out by the Examiner, the reference discloses a Cr-Mo steel having composition that partly overlaps that of the Cr-Mo steel of the present invention. The reference also discloses that this Cr-Mo steel can be used in heat exchangers, pipes, valves, and other welded structures. Further, the reference describes the relationship between precipitates within grains and at grain boundaries and the composition of the Cr-Mo steel.

The reference indeed discloses tempering after normalizing as a heat treatment for tempered steel or hot rolled cast steel. However, this is a general heat treatment performed on commercially available low alloy Cr-Mo steels. It is not possible to avoid occurrence of creep damage, such as type IV creep damage, by merely combining this heat treatment and hot working and annealing (at a temperature of 700-730°C) before welding. The Examiner's attention is directed to FIG. 8B of the present specification, which is provided below for the Examiner's convenience.

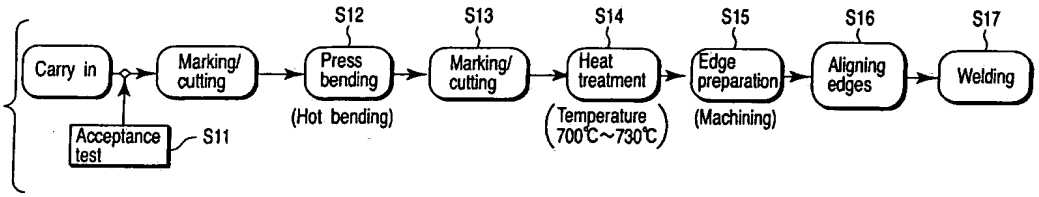

FIG. 8B (PRIOR ART)

In the general heat treatment process, as mentioned on page 3, line 15 to page 4, line 24 of the present specification (describing FIG. 8B),

> steel lumber is marked and then cut into steel pieces (S11). Then, steel pieces are bent by hot working (S12). Another marking is carried out on the pieces and then cut (S13). The cut pieces are subjected to a heat treatment (S14). Subsequently, the treated pieces are subjected to a mechanical edge preparation (15). The prepared pieces are aligned edges each other (S16) and then welded together by a submerged arc welding method (S17).
>
> When manufacturing a heat-resisting steel pipe by processing ferritic low alloy steel with the above-described procedure, it is difficult to avoid the occurrence of a creep damage in the HAZ [(heat affected zone)]. Especially, in the manufacture of a thick steel pipe having a thickness of 25 to 150 mm, the submerged arc welding is carried out for 5 to 50 layers. Therefore, the base metal situated near a weld zone is exposed to multiple heat cycles, in which quick heating and quick cooling are repeatedly carried out. For this reason, the grains become finer and finer in the HAZ.
>
> Further, in the case where, for example, such heat-resisting steel pipes are used to build a large-diameter pipe for a thermal

> power plant, these heat-resisting steel pipes are exposed to a high-temperature and high-pressure environment such as a temperature of 538 to 566 °C and a pressure of 169 to 316 kg/cm^2 due to the steam flowing through the large-diameter pipe. Further, a stress of 4 kg/mm^2 load on the pipe in its circumferential direction. Therefore, **in the HAZ fine grained region, a creep damage of the type 4 easily occurs, thereby shortening the lifetime of the component. The damaged section must be repaired, or if the damage is too severe to repair, the pipe itself must be replaced, costing a great amount of expense.**

(Emphasis added).

In contrast, the present inventors of the claimed invention have discovered the mechanism of the occurrence of type IV creep damage at the weld HAZ during operation, in which the present inventors have carried out extensive studies on creep damage of type IV. *See, e.g.*, the present specification at page 7, line 17 to page 10, line 12, and FIGS. 2-7 for a detailed discussion and analysis of the discovered mechanism.

In the present invention, based on this mechanism, a base metal is normalized one or more times additionally, before being welded. The Examiner's attention is directed to FIG. 8A of the present specification, which is provided below for the Examiner's convenience.

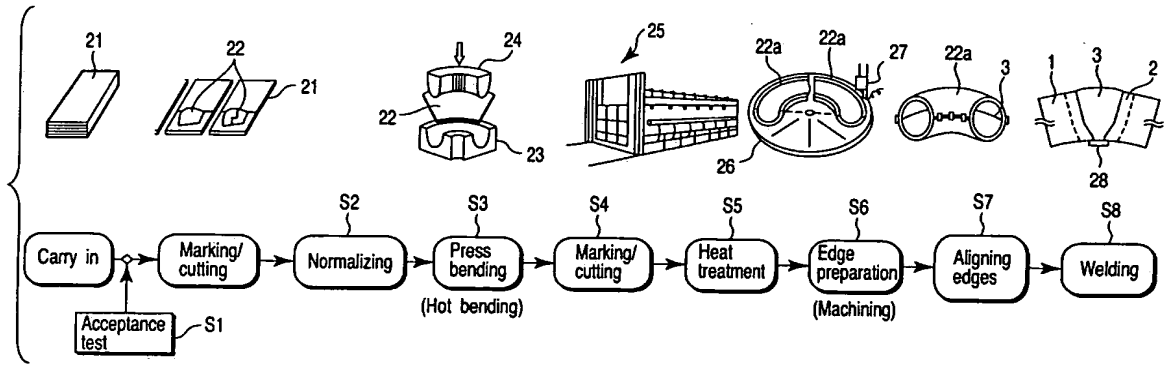

FIG. 8A

In particular, as discussed at page 10, lines 13-22 of the present specification,

> [b]ased on the findings described above [relating to the mechanism of the occurrence of type IV creep damage], the

> present invention aims to reduce the amount of coarse carbides, which cause to damages of type 4, remaining in former austenite (γ) grain boundaries of a welded component (base metal). With the invention, the creep lifetime of the weld zone of the heat-resisting steel can be significantly improved. More specifically, before the base metal is welded, it is **subjected to normalizing once or more times [S2, shown above in FIG.8A]**, thereby reducing the amount of coarse carbides.

(Emphasis added).

By performing this step, it becomes possible to prevent the occurrence of type IV creep damage in the HAZ, and provide a long-life heat-resisting low alloy steel welded component.

The EP '026 reference does not disclose or suggest normalizing a steel plate one or more times before welding, such that type IV creep damage is prevented. The reference merely defines the alloy composition of heat-resisting steel, the size and density of precipitates within grains, and the shape and mass of precipitates at grain boundaries, in order to achieve high creep strength and high strength at elevated temperatures.

Thus, in view of the above stated reasons, Applicants respectfully request the withdrawal of the rejection under 35 U.S.C. § 102(b).

Applicants submit that this application is now in condition for allowance and early notification of such is earnestly solicited.

Respectfully submitted,

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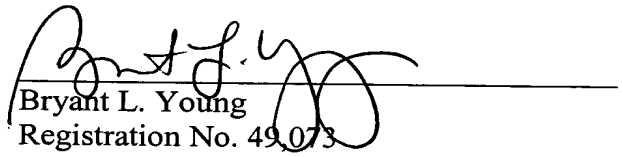

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